ART. II.—*Tumours of the Brain; Clinical History and Comments.*

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THREE cases of tumour of the brain have come under my charge in the wards of the Hospital of the Good Samaritan, during the past year; unfortunately, one only could be followed to its termination, and the diagnosis verified by an autopsical examination. The symptoms in the other cases, however, were so characteristic as to leave no room for doubt. The large number of observations which have been accumulated, the recent advances made in our knowledge of the physiology of the brain, and the improved methods available for investigation, have greatly increased the facility and certainty of diagnosis. Although, in view of what has been accomplished, the cases here narrated may not possess the merit of novelty, they will serve as centres about which the best ascertained facts may be grouped. They will illustrate, also, whatever of certainty and uncertainty exists in the diagnosis of this class of cerebral affections. Careful study of the symptomatology of cerebral tumours will contribute to our knowledge of the functions of the brain—for these growths, in many instances, impinge upon or destroy parts without affecting neighbouring organs, more perfectly than can be accomplished by the knife of the experimental physiologist. On the other hand, as the brain is a compound organ, made up of many different parts having different functions, a tumour involving one or more of these parts will be accompanied by symptoms correspondingly diverse. Any case, therefore, carefully reported, especially if verified by autopsical inspection, must possess a certain value not only for the student of physiology, but also for the practical physician.

CASE I.—Tim, an Irishman, aged about forty, of light complexion and full habit. Admitted September, 1866. He had had, for several months, a persistent headache, accompanied with "swimming in the head," and difficulty of locomotion. He referred the origin of these symptoms to that not unusual Irish accident, sunstroke—(epileptic seizure?)

Symptoms on Admission.—When brought into the ward he is supposed by the attendants to be intoxicated. His gait is staggering; he is noisy and talkative; and his face has a bloated, dissipated appearance. When an attendant leads him forward, he manifests a strong tendency to backward movements; he throws his head and shoulders backward, and moves his legs forward only as compelled by the forward propulsion; when the force propelling him is withdrawn, he tends backward by rapid steps, and would fall supine if not arrested. An evident degree of ataxia exists; his gait is hesitating, somewhat like that observed in progressive locomotor ataxia, and he manifests a great fear of falling. When moved to and fro by the attendants, he becomes angry and noisy; but his good humour returns with his sense of security when seated in a chair.

His eyes are prominent and staring; pupils dilated, and responding slowly to the stimulus of light. It is ascertained that vision is dim (amblyopia). Hearing is obtuse, which he attributes to *tinnitus aurium*. He complains of severe attacks of cephalalgia, which he refers chiefly to the occiput. Sensibility is somewhat heightened in the distribution of the fifth pair. There is decided paresis of the facial, which gives to his countenance its blank and expressionless character. So far as can be ascertained there is no alteration of the sense of taste. The tongue is not impaired in any of its movements; he talks volubly in a voice pitched in a high key. Much of his conversation is in reference to the illusions produced by his disorder of vision, but he reasons correctly on all subjects which he can consider subjectively.

Progress of the Case.—But slight changes were noted from week to week. His perception of light gradually diminished. Some congestion of the conjunctivæ appeared; the pupils continued dilated, sluggish in movement, and finally ceased to respond to the stimulus of light (amaurosis). The peculiarities in his locomotion noted at the time of his admission, continued. The hyperæsthesia of the fifth and the paresis of the seventh, increased slowly. In eating, which he did voraciously, he was unable to maintain control of the food, a portion of which, in spite of all his efforts, escaping from his mouth. Deglutition continued unaffected. Respiration, sanguification, and calorification were normally performed.

As the case progressed his mind became enfeebled. He grew more noisy and quarrelsome, and had paroxysms of fury which rendered it necessary to confine him. His fits of fury subsided, generally, when he was left alone. During the whole period of his stay in the hospital he had no convulsions, no vomiting. The tendency to backward movement became much more decided at the last, so that it was difficult to move him forward. A part of this peculiar movement seemed to be due to his blindness and a fear of falling. When compelled to move he manifested considerable terror. This was particularly observable when brought into the lecture-room in presence of the class.

It is much to be regretted that no ophthalmoscopic examination of his eyes was made. There can be no doubt, however, that they were in the condition observed in the case next to be related.

After a stay of three months in the hospital, Tim was transferred to the County Infirmary, and all trace of him became lost.

Commentary.—The symptoms in this case—the pain in the head, the vertigo, the impairment of vision, the hyperæsthesia of the fifth, the paresis of the seventh, the attacks of fury, the illusions, the disorders of locomotion, and, finally, the progressive feebleness of the intellectual faculties—indicate a lesion of the encephalon. In making up the differential diagnosis, we may at once exclude all acute affections of the organs within the cranium.

It is not a case of progressive paralysis. The first symptoms of this disease are paralysis of the tongue, muscular feebleness and paralysis, impaired intellectual power,[1] &c. Our patient, Tim, presented none of these symptoms except impairment of intellection; which, however, came on late in the progress of his case. He had neither paralysis of the tongue nor of any of the voluntary muscles except those supplied by the facial. A very marked distinction exists between defects of co-ordination and backward movements, and muscular paralysis.

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[1] Calmeil, De la Paralysie considerée chez les aliénés, &c., p. 10 et seq. Paris, 1826.

It is not a case of senile dementia. In an immense majority of cases, says Marcé,[1] senile dementia takes its origin in an attack of apoplexy, acute softening, or softening of a chronic and progressive form. Paralysis, hemiplegia, or general paralysis, is an attendant symptom in all these cases.

It is not a case of progressive locomotor ataxia. The case of Tim agrees with this disorder as respects the difficulty of co-ordination, and the occurrence of certain ocular derangements. But there are well-marked points of difference. In ataxia, pains in the extremities presumed to be rheumatic, numbness, tingling, and various referred sensations precede the disorder of co-ordination. The ataxia, of the progressive locomotor ataxia, is very different in character from that observed in Tim's case, and is not accompanied by the tendency to backward movements. Moreover, the phenomena of cerebral congestion, the attacks of fury, the hyperæsthesia of the fifth and the paresis of the seventh, and the intellectual derangement, are very different symptoms from those observed in progressive locomotor ataxia.

In coming to a conclusion as to the seat of the lesion in this case, we are aided by the facts of experimental physiology and of pathological anatomy.

Flourens, in 1822, as the result of his vivisections, concluded that the cerebellum is the exclusive seat of the power to co-ordinate muscular movements. Magendie, Longet, and various experimental physiologists, arrived at the same conclusion. Magendie, however, advanced a point beyond this. He demonstrated that the cerebellum presided over the forward movements, and that the corpora striata exercised a similar office for the backward movements. When he ablated the cerebellum, the animal experimented on manifested a strong tendency to backward movements; and when he ablated the corpora striata, to violent forward movements. These conclusions of Magendie, a long time disputed, have been confirmed in a striking manner by two able physiologists experimenting in the same direction, by the same means, and at the same time, in different hemispheres. I allude to the investigations of Drs. Mitchell[2] of Philadelphia, and Richardson, of London.[3] These gentlemen succeeded in abolishing, for the time being, the functions of certain portions of the encephalon by freezing them with rhigolene and ether spray. They both ascertained that suppression of the functions of the cerebellum by freezing produced backward movements. In Richardson's language, "The animal, without the cerebellum, shows evidence of backward movements; which means that the controlling or compensating power of the cerebellum being cut off, that part of the cerebral organism which commands backward movement is allowed undue play, and overcomes volition or will." In another place he expresses the same idea in different language: "When we see, therefore, an animal fall backwards because its cerebellar functions are positively in abeyance, we see the action of the great anterior cerebral ganglia. Conversely, when we see an animal pitch forward because the cerebrum is rendered inert, we see in play the unchecked forward propulsion of the cerebellum."

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[1] Recherches Cliniques et Anatomo-Pathologiques sur la Démence Sénile et sur les Différences qui la Séparant de la Paralysie Générale. Paris, 1863.

[2] American Journal of the Medical Sciences, January, 1867.

[3] Medical Times and Gazette, May 25, 1867. The priority in these investigations clearly rests with our countryman, Dr. Mitchell.

These demonstrations are very conclusive, but the facts of pathological anatomy are equally so.

Various cases of affection of the cerebellum have been published, proving that lesion of this organ is accompanied by the peculiar symptoms manifested in this case. Topinard[1] has made an interesting collection of twenty-four cases showing the production of ataxic phenomena in cerebellar affections. Abercrombie[2] gives an interesting account of a tumour of the cerebellum, in which case "the walk was tremulous and unsteady, like a person balancing a burden on the head."

Lallemand[3] gives, in his remarkable collection of cases, various instances of encysted abscess, of softening, and of tumour of the cerebellum, in which these affections produced uncertain and difficult locomotion, cephalalgia, amaurosis—and, indeed, all of the phenomena observed in the cases here reported. In addition to these, but including many of the cases reported by Lallemand, Abercrombie, and Topinard, Luys[4] has collected one hundred cases of disease of the cerebellum, the history and symptomatology of which agree with my own.

I am prepared, then, to state, that in the case narrated in this paper, there existed a chronic affection of the cerebellum. What was the character of the lesion? Not to anticipate the discussion to follow, it may be stated that the history and symptomatology correspond to those which have been observed in cases of *tumour of the brain.* Was the lesion confined to the cerebellum? It is quite evident that the facial and auditory nerves were somewhat interfered with. There was neither convergent nor divergent strabismus; vomiting had not occurred. These facts sufficiently indicate that, so long as the patient remained under my observation, the tumour extended but little beyond the boundary of the cerebellum.

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[1] De l'Ataxie Locomotrice et en particulier de la Maladie appelée Ataxie Locomotrice Progressive. Chap. II., art. Premier. Paris, 1864.

[2] Diseases of the Brain and Spinal Cord. Edinburgh, 1836.

[3] Recherches Anatomico-Pathologiques sur l'Encéphale et ses Dependances. Paris, 1820–30. Consult especially the fourth and fifth letters.

[4] Études sur l'Anatomie, la Physiologie et la Pathologie du Cervelet; par J. Luys, Médecine des Hôpitaux de Paris. Archives Générales de Médecine, for October, November, and December, 1864.

CASE II.[1]—I. M. H., aged 43, a native of the United States, by occupation a ship-carpenter. He is 6 feet in height, of dark complexion, and weighs 152 pounds. Previously to the development of the trouble for the relief of which he has sought admission to the hospital, H. has had no other illness than two attacks of acute rheumatism. There is no history of hereditary nervous diseases in his family.

History of the Case.—H. experienced the first symptom of his present disorder sixteen months ago. The attack commenced with headache, nausea and vomiting, pains in the back, extending forwards anteriorly over the right and left inguinal regions and to the glans penis. The pains in the head were severe, but intermittent, and could be relieved by the application of warmth. He vomited frequently during the day, without much effort, and with little action of the abdominal muscles. The loss of flesh which he experienced appeared to be the result of this interference with the primary assimilation. Soon after the foregoing symptoms manifested themselves, H. began to experience disorders of locomotion, and so marked were they that he was accused by his neighbours of intoxication. Physicians whom he consulted called his case "partial paralysis;" a seton was inserted in his neck, and tonics administered. He was admitted to the Hospital of the Good Samaritan November 8, 1867.

Symptoms on Admission.—H. has a countenance of uneasiness and distress difficult to describe. The right palpebral opening being wider than the left, imparts a peculiar expression to his face. His speech is thick and stuttering, but his tongue is protruded without difficulty, and does not deviate to either side. The operations of his mind seem normal, but a friend who accompanied him to the hospital reports that some deficiencies of intellect and peculiarities of conduct have been observed lately. He complains of pain in the forehead and occiput of a neuralgic character, and of attacks of giddiness. At night he is restless, talking in his sleep, and occasionally getting out of bed in a somnambulistic state, walking a few steps, when he falls and awakes. The special senses of smell and taste seem to be unaffected. He hears with the left ear, but is totally deaf in the right. His vision is dim and uncertain. The movements of the ocular globes, particularly the right, are decidedly ataxic (bilateral nystagmus). Prof. Seeley, ophthalmologist to the hospital, thus describes the ophthalmoscopic appearances: "Size of pupils normal. Reflex and accommodative movements normal. Ophthalmoscope reveals congestion of both papillæ, evidenced by the deep pinkish tint, caused by the development of a large number of capillaries, and entire want of definition of papillæ, except a portion of external border. In addition, there is slight exudation along the track of some of the vessels on right papillæ. Veins and arteries of both retinæ enlarged. No hemorrhage along their course."

H.'s appetite is rather poor. He has frequent attacks of regurgitation of food. His bowels are constipated. There is found to be a difference f $1\frac{3}{5}^\circ$ F. in his morning and evening temperature. The most striking symptom is the ataxia in the muscles of the extremities, especially of the right. He cannot stand alone, with his eyes closed. He cannot touch the point of his nose with his right index-finger, unless he guides the hand by his eyes. His walk is staggering and uncertain, very much like that of an intoxicated man. He does not point his toes upward in walking, and bring his heels with violence upon the floor. His muscular strength is preserved. When his leg is flexed upon the thigh, no inconsiderable force is required to extend it. His grasp is as strong as in health. Cutaneous sensibility is rather heightened than diminished; at least this observation is true with respect to sensibility to pain. Sensibility to cold, to heat, and to pressure unaffected. He has no numbness, tingling, or referred sensations in either extremities.

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[1] Reported by Dr. T. C. Minor, Resident Physician.

H. remained in the hospital but a few days. Dissatisfied that a cure was not promised him, he left under a pretence of a visit to his family, and did not return.

Commentary.—We have here a disorder which interferes with the power of co-ordinating muscular movements. This fact is exhibited in the ataxic movements of the eyes, of the tongue, and of the muscles of the right lateral half of the body. The malady with which it would be most readily confounded is progressive locomotor ataxia. In this disease, however, cutaneous and muscular anæsthesia, numbness, tingling, and characteristic pains precede and accompany the disorders of locomotion.

A case presenting many points of resemblance has been published by Dr. F. Bateman,[1] physician to the Norfolk and Norwich Hospital. The patient had first shaking of the right hand, which was followed by frontal headache, weakness of legs, and a staggering gait, as if intoxicated. Next embarrassment of speech came on, then dimness of vision, and finally complete blindness, the right eye being the first affected. The order and character of the symptoms are, it will be perceived, almost identical with those which occurred in H.'s case. At the autopsy a steatomatous tumour, the size of a hen's egg, was found "adherent to and apparently springing from the posterior surface of the petrous portion of the right temporal and from the basilar process of the occipital bones." It encroached upon the under surface of the right lobe of the cerebellum, the right side of the medulla oblongata, the right crus cerebelli, and the right side of the pons Varolii in its whole extent.

In my clinical lecture upon the man H., I assigned the supposed neoplasm to a similar position.

CASE III.—T. F., an Irish coachman, admitted to the Hospital of the Good Samaritan during the month of October, 1866.

Symptoms on Admission.—His countenance presents an aspect of suffering; he has violent pains throughout the distribution of the left trigeminus; the left eye is suffused and congested, pupil dilated; the left side of the face is swelled, reddened, and excessively sensitive.

His intellectual acts are normally performed. He describes his sensations with accuracy, and talks rationally on any subject within the range of his acquirements. He ascribes his sensations to sunstroke received during the month of July. Since the time of this supposed attack he has suffered more or less from headache, but especially from the pain in the left side of the face. Reflecting over his history, aided by the subsequent developments in his case, it is not improbable that this so-called "sunstroke" was really an epileptic seizure.

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[1] Beale's Archives of Medicine, April 16, 1867.

At this period he seemed absolutely free from all symptoms other than those just detailed. His case was accordingly considered one of tic douloureux, due to some intra-cranial trouble.

Progress of the Case.—In a few weeks after his admission new symptoms declared themselves. It was observed that he had some difficulty in maintaining the erect position, that he staggered in walking, and that he preferred to lie in bed upon his back. He still referred his suffering chiefly to the distribution of the fifth, but he also complained of a dull aching of his head. The left eye continued much congested, the pupil dilated; the left side of the nostril also became very red and much swollen, and the hyperæsthesia of the left side of the face increased. Considerable hebetude of mind was now observed; his sense of hearing became dull, and taste appeared to be entirely abolished.

One day, after some hours of stupor, he was suddenly attacked with violent convulsions and maniacal excitement, during which he attempted to bite and otherwise injure all who approached him. This state of excitement was accompanied with heat of surface and hyperæsthesia, especially of right side of the body and right inferior extremities. After this acute attack, it was observed that both pupils were dilated, and that his perception of light was much diminished. Soon the pupil of the left eye ceased to respond to the light; the redness and turgidity of the conjunctiva, of the face, and of the nostril of the left side increased, and attacks of epistaxis from this nostril became frequent.

The convulsive seizures became more frequent, but occurred at irregular intervals. It was observed that some hours of stupor invariably preceded the attack, and that the convulsion was followed by noisy delirium lasting about twenty-four hours.

The pupils remained dilated and motionless, and at length perception of light was completely lost, although, in answer to my inquiries, he always replied that he saw at "seven o'clock this morning." Prof. Seeley, at my request, made an ophthalmoscopic examination of his eyes, and although this was not very satisfactory, in consequence of the patient's restlessness, the Doctor ascertained that the optic papillæ were altered, the retinal vessels much engorged, and that excavations existed in the retina. He expressed the opinion that the case was one of cerebral tumour. This opinion I had begun to form myself, although misled by the hyperæsthesia of the fifth, I had supposed in the beginning that my patient was labouring under chronic inflammatory trouble, with exudation, involving that portion of the brain from which this nerve takes its origin.

The case increased in gravity. Vomiting and obstinate constipation were superadded to the other troubles. His speech became thick and stuttering, and some dysphagia occurred. His taste was completely lost, so that a drop of croton oil excited no more sensation than a drop of water. He lay at last in a state of semi-unconsciousness, except when roused by his convulsive seizures, when he screamed and raved and seemed in the deepest distress for several hours.

The patient was at length transferred to the Commercial Hospital, where he died on the 14th of April. Prof. E. Williams, soon after T.'s admission, made an ophthalmoscopic examination, which confirmed the previous examination of Prof. Seeley. I quote his observations, as recorded by Dr. James T. Whitaker, resident physician. The examination "revealed an enlarged and tortuous condition of the retinal veins and blurred appearance of the optic papillæ, with structural retinal changes, which he attributed to a tumour somewhere at the base of the brain, interfering with the venous circulation."

I extract from the same report an account of the post-mortem appearances:—

"*Autopsy by Prof. Wm. H. Taylor, M. D., Pathologist to Commercial Hospital, seven hours after death.*—Firm post-mortem rigidity; contusion an inch and a half long over left supra-orbital ridge; dry herpetic eruption on upper lip; bedsore covering entire sacrum, and one over each trochanter; more than usual contraction of fingers. Over right half of frontal bone recently extravasated blood in connective tissue; dura mater firmly adherent to calvarium; membranes much engorged with blood; increased number of *puncta vasculosa* in substance of brain; two ounces of colourless serum in lateral ventricles, which were expanded in transverse diameter; effusion into infundibulum compressing optic commissure; small amount of serum in middle fossa; anterior portion of right hemisphere of cerebellum firmly adherent to cranium; lying anteriorly to and below the right hemisphere a firm nodulated tumour, which was enveloped in a distinct capsule attached to, but easily separated from, the membranes; tumour 4½ and 3½ inches in its circumferences, encephaloid in structure, consisting, under the microscope, of cells and exudation-corpuscles inclosed in a fibrous stroma. (?)

"Tumour had compressed the right half of the medulla oblongata towards the median line, implicating the right pneumogastric nerve.

"Imbedded in the substance of the cerebrum, above and behind the tumour, was a pyriform cyst, two inches in its long diameter, and one and a half inch in its short, the apex of which extended into the crus cerebri. Surrounding brain substance of semifluid consistence."

Commentary.—These cases agree in many respects, but also present points of difference, due, no doubt, to the different position of the tumour in each case. An analysis of the symptoms will exhibit this fact fully.

Cephalalgia was the first symptom noted in each case, but it was more violent, constant, and "obstinate" in the first than in the others. This symptom has been generally observed in cases of tumour of the brain, especially when the growth occupies or involves some portion of the cerebrum; but it is also present in the cases of tumour of the cerebellum, pons, and medulla. Ladame,[1] in a collection of twenty-six cases of tumour of the annular protuberance found that headache was a symptom in sixteen. It is rarely distinctive of the position of the tumour, being generally deep-seated, widely distributed, and not confined to a special locality. In some cases of tumour at the base, the pain is localized at the occiput; in some cases of tumour of the hemisphere, pain is confined to the upper part of the head and to the forehead. Ladame considers cephalalgia a symptom of great importance, especially when it comes on without obvious cause, persists and increases in violence. Rostan,[1] on the other hand, regards headache as a very constant and characteristic symptom in softening. Both writers use the same term, *opiniâtre,* in describing the character of the headache. In cases of *ramollissement,* however, feebleness of the intellectual faculties and paralysis quickly follow the first onset of cephalalgia. Todd[2] thinks that "where the pain, whether sharp and burning, or dull and heavy, is fixed in its situation, and varies only in intensity, and not in locality; it may generally be referred to intracranial irritation, such as would probably arise from disease of the membranes, or of some superficial parts of the brain." In the beginning of these various affections of the brain, it would certainly be assuming too much to assign a definite diagnostic value to the cephalalgia.

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[1] Des Tumeurs de la protubérance annulaire. Archives Générales de Médecine, Août et Septembre, 1865. I regret my inability to procure Dr. Ladame's "Symptomatologie und Diagnostik der Hirngeschwülste."

In the first case, the headache, in the beginning, had an intermittent character; but it finally became continuous, and increased in severity, and was not localized. In the second case, the pain seemed superficial, rather in the scalp of the forehead and occiput than in the brain itself—for not only was the pain neuralgic in character, but it was relieved by the application of warmth. In the third case, a violent tic seemed to be substituted for the headache, yet in the paroxysms of excitement attended by convulsions the manner in which the patient applied his hands to his head indicated excruciating cephalalgia. The hyperæsthesia of the left trigeminus in case third is a remarkable fact. The "nodulated tumour" and the cyst both occupied the right side. Unfortunately, the account of the post-mortem appearances does not state clearly the precise position of the tumours and the parts impinged upon by them, but it is evident enough that they could not have involved the left trigeminus.

Alterations of sensibility in parts supplied by the fifth, are very common, and the hyperæsthesia cannot be distinguished, as Ladame has well observed, from ordinary facial neuralgia. In T.'s case, the tic of the left side was the only symptom at the time of his admission into the hospital. It was so well-marked a case of neuralgia of the trifacial, due to some intracranial trouble, that I made it the subject of a clinical lecture. At this time the left pupil was dilated; the sight was dim, and the conjunctiva intensely congested; the whole side of the face was swollen, the left anterior nares injected, and the left half of the upper lip covered with an eczematous eruption. These alterations in the nutrition of the parts supplied by the trigeminus, are common enough in ordinary cases of tic-douloureux, and hence their occurrence in this case afforded us no precise indication of the nature and position of the intracranial trouble.[1] Ladame has observed these symptoms in tumours of the middle fossa, and Romberg reports a case in which they were produced by an aneurism of the internal carotid. In both of these the fifth was directly involved. The peculiarity of the case here reported consisted in the production of a violent tic in the left side, the lesion being on the right. Schrœder Van Der Kolk,[2] as also Luys, have published observations which explain this apparent anomaly. They show that although "the nerves of sensation do not decussate, and terminate in nuclei on their own side, the impression produced in them is conveyed to the opposite side. . . . No anatomist has ever asserted that the sensitive root of the trigeminus itself arises from the opposite side of the medulla oblongata. . . . It is, however, evident that the sensitive influence must be conveyed to the opposite side, just as occurs in the nerves of motion, as otherwise no harmony could exist between the two sides. Hence it appears that the perception of sensation cannot be situated in the nuclei of the nerves themselves, as those of the vagus, glosso-pharyngeus, and trigeminus; but the impression excited here must be conveyed by other fibres, which, as we have seen, decussate to the other side." Luys[3] describes, in a similar manner, the commissural fibres which connect the trigemini.

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[1] Recherches sur le Ramollissement du Cervau, p. 12, deux edition. Paris, 1823.

[2] Clinical Lectures on Paralysis, Am. ed., p. 34.

In each of my cases, affections of the organs of sense existed. These are very common in tumours at the base. In twenty-seven cases of tumour of the cerebellum recorded by Luys,[4] feebleness of vision, or amaurosis, was observed in ten; and other disorders of vision in three. Deafness was noted in four. Friederich,[5] in forty-four cases of tumour of the cranial cavity in general, has found disorders of the organs of sense twenty-six times; vision alone, twelve times; and associated with derangement of the other senses, thirteen times. Ladame has observed them twenty times in twenty-six cases. The latter, in his paper in the *Archives Générales*, thus states the relative frequency of these disorders of the organs of special sense in tumours of the annular protuberance:—

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[1] Axenfeld, Des Nevroses; Romberg, Manual of the Nervous Diseases of Man, Sydenham Society translation; Recherches sur quelques troubles de Nutrition consecutifs aux Affections des Nerves, par J. B. A. Mougeot: Paris, 1867. The last-named makes frequent references to the very important contributions of our own countrymen, Drs. Mitchell, Morehouse, and Keen—"Gunshot and other Injuries of Nerves."

[2] On the Minute Structure and Function of the Spinal Cord and Medulla Oblongata. Syd. Soc. translation, p. 113.

[3] Recherches sur le Système Nerveux, &c.

[4] Ibid., p. 78.

[5] Quoted by Perrenout, Étude Clinique sur le Diagnostie des Tumeurs Cérébrales. (Arch. Gén.)

Convergent strabismus	6
Divergent strabismus	1
Diplopia	2
Ptosis	2
Dilated pupils	4
Inequality of the pupils	2
Contracted pupils	1
Insensibility of the conjunctiva	1
Injection or inflammation of the conjunctiva	2
Amblyopia or amaurosis	10
Dulness of hearing, or deafness	7
Noises in the ear	2
Alterations of taste	6
Alterations of smell	4

These affections of the senses are variously combined. Ladame arranges them as follows:—

Vision, hearing, smell, and taste	1
Hearing, smell, and taste	1
Vision, hearing, and smell	1
Vision, smell, and taste	2
Vision, hearing, and taste	1
Vision and hearing	3
Taste only	1
Hearing only	2
Vision only	2

These statistics show that the eye is more constantly affected than any of the organs of special sense. In each of my cases there were disturbances of vision; in two, amaurosis; in one, dimness of vision; in two, loss of hearing upon one side was observed; in one, loss of taste occurred.

The most interesting and important circumstance, as respects the organ of vision, is the occurrence of amblyopia and amaurosis. As the statistics above quoted show, this symptom is observed in nearly one-half of the cases of tumour occurring at the base of the brain. I was fortunate in being able to avail myself of the aid of Prof. Seeley's careful ophthalmoscopic examination of Cases 2 and 3. His description of the condition of the retina in Case 3 was also confirmed by a subsequent examination made by Prof. E. Williams. The alterations of the retinæ, as described by these very competent observers, correspond to the description of Bouchut, as given in his very elaborate volume.[1] He says:—

> "The principal and most definite lesion is *amaurosis*, the result of atrophy of the optic nerve produced by lesions of the circulation (hyperæmia, or serous infiltration), which occurs in the beginning of the disease. When the atrophy is fully established, vision is irrevocably lost. The

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[1] Du Diagnostic des Maladies du Système Nerveux, par l'Ophthalmoscopie, p. 300. Paris, 1866.

nerve-cells and tubes are converted into connective tissue, into adipose tissue, and amyloid matter. During life this state of things may be recognized, on ophthalmoscopic examination, as an atrophy of the optic papillæ. At the fundus of the eye the papillæ appear blanched, glistening (*nacrée*), having at their centre a whiter spot, in which the ordinary concentric rings are scarcely visible. The papillæ diminish in size, becoming irregular, ragged, or deeply excavated, and the smaller vessels lessen in volume and finally disappear, leaving only the principal veins of the retina."

Bouchut gives, in the body of his work, several instructive wood-cuts, which exhibit the changes in the papillæ, and the deep excavations sometimes produced in the retina. In the atlas accompanying his work are several plates showing the ophthalmoscopic appearances of the retina.[1]

Ladame, however, in describing the condition of the retina in cases of tumour of the brain, observes that two varieties of atrophy of the optic nerve exist. The first variety, which, he says, takes place without inflammation, corresponds to the description just quoted from the work of M. Bouchut. The second variety is that in which atrophy follows neuritis; in this condition the papillæ, instead of being white and glistening, become blurred, the vessels tortuous, and pigment accumulates about the nerve entrance.

"Mr. Wecker supposes that when an intracranial tumour grows very rapidly, it causes neuritis; whereas, when the growth is more gradual, it may give rise to progressive atrophy, especially when it directly presses on the roots of the optic nerve." But it is not necessary that the intracranial disease should involve the optic nerve-fibres in any part of their course in order to produce amaurosis. Dr. Hughlings Jackson says: "So far as the production of optic neuritis, by intracranial disease, is concerned, the *position* of the disease seems to be of little consequence, and there is nothing very peculiar in its nature, except that it is usually coarse."[2]

Liebreich[3] gives two figures, showing the blurred appearance of the papillæ in cases of cerebral tumour. Galezowski[4] also gives two figures, showing the changes in the retina in a case of tumour of the posterior fossa. First there occurred a neuritis—a varicose condition of the central vein, and especially of the capillary vessels of the papillæ. This neuritis resulted in complete atrophy. At page 150 Galezowski describes more in detail the ophthalmoscopic appearances: the papillæ are œdematous and prominent; veins enlarged, varicose, and tortuous; collateral branches enlarged, &c. Three months afterward, vision being lost, he found an atrophy of the papillæ, their margins being fringed and irregular. This condition was produced by an organized peripapillar exudation, and consequent atrophy of the nerve-fibres.

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[1] Sichel, in 1859, appears to have been the first to employ the ophthalmoscope in the diagnosis of cerebral affections. In the following year, 1860, Graefe communicated several cases to the Biological Society. Droux also published, in 1862, a number of cases which he had observed at the clinic of Desmarres. (Bouchut.)

[2] Ophthalmic Review, vol. iii. p. 48. Quoted in Dublin Quarterly Journal, November, 1866.

[3] Atlas d'Ophthal., Pl. xi., Figs. 7, 8, and 9. See especially Figs. 8 and 9, and consult remarks on these.

[4] Étude Ophthalmoscopique sur les Altérations du Nerf Optique et sur les Maladies Cérébrales dont elles dependent. Chap. ii. p. 138. Paris, 1866.

If a cerebral tumour impinge upon or destroy the tubercula quadrigemina or optic chiasm, there can be no doubt as to the manner in which the result is accomplished. Graefe emitted the opinion that the dilatation of the veins of the retina, serous infiltration and atrophy of the nerve, are the results of pressure of the tumour upon the cavernous sinus, whereby the return of blood is prevented. Graefe's followers adhere to this doctrine in spite of the most conclusive demonstrations against it. These views have been successfully combated by Lancereaux, in a paper published in the *Archives Générales* for January and February, 1864.[1] This observer has shown that pressure upon the cavernous sinus cannot exist in many cases in which these changes in the retina are found. He reports four cases: in the first, a serous cyst existed in the right anterior lobe; in the second, a neoplasm, the size of a duck's egg, in the depth of the left anterior lobe; in the third, the corpus striatum, and part of the optic thalamus of the right side, were replaced by a membranous neoplasm; and in the fourth, induration of a part of the corpus striatum and optic thalamus of the right side, inflammation of the meninges at the base, and exudation were found. In these cases characteristic alterations were observed in the retina and optic nerve, which could not be referred to a mechanical hyperæmia. With respect to the first case, Lancereaux remarks that "compression of the optic nerves and cavernous sinus was not possible;" in the second, the moderate compression exerted by the tumour on the mass of the cerebral lobe cannot be considered sufficient to cause atrophy of the optic nerve; in the third, so far from the tumour making any pressure, "the brain diminished in volume, occupied but a part of the cranial cavity;" and, in the fourth case, "the idea that a certain degree of compression having determined the amaurosis and atrophy of the optic nerve is not more admissible than in the preceding cases."

These facts are conclusive against Graefe's view, at least in respect to many cases. Nevertheless, there are some cases in which engorgement of the retinal vessels seems to be produced by pressure upon the cavernous sinus. Bouchut notes amaurosis, atrophy of the nerve, &c., in various inflammatory and chronic structural changes of the brain and meninges. He expresses the truth, no doubt, when he asserts that the alterations of the retina are due to congestion, effusion, and inflammatory changes wrought in the brain by the presence of the new formation. Changes similar in character are found in cases of diabetic amblyopia.[1] In Case III. the growths were not in a position to compress the cavernous sinus, and, what is equally significant, the most marked changes in the retina followed the first febrile movement, which was no doubt coincident with inflammation of the meninges in the neighbourhood of the tumour, and with the formation of the so-called cyst in the right posterior lobe of the cerebrum.

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[1] De l'Amaurose liée à la Dégénération des Nerfs Optiques, dans les Cas d'Alteration des Hemispheres Cérébraux, par le Dr. E. Lancereaux, Chef de Clinique Médicale à la Faculté de Médecine de Paris.

Galezowski[2] proposes an eminently rational explanation of the occurrence of amaurosis in the case of neoplasms in the posterior fossa of the cranium.

> "These new growths," he remarks, "impinge upon the neighbouring organs, and especially upon the pons and the peduncles of the cerebellum. As the tubercula quadrigemina are situated above the pons, and as the peduncles of the cerebellum communicate with the same bodies, an inflammation of these organs is not unfrequently transmitted to the tubercula quadrigemina, thence to the optic tract and to the optic papilla. Such is the explanation which we have to offer of the occurrence of optic neuritis consecutive to tumours of the basilar process."

With respect to the mode of production of amaurosis in cases of tumour of the cerebral hemispheres, Galezowski makes the following observations:—

> "Alterations of the anterior lobes of the cerebrum do not exist long without producing inflammation and softening in the surrounding parts. These lesions may include the organs of sense, and especially the optic nerves, producing an inflammation or an atrophy which travels along the nerve to the papilla. We are able to explain in this way the phenomenon of blindness in the case of tumours and cysts of the anterior lobes. M. Graefe has attempted to explain the coexistence of amaurosis and optic neuritis with cerebral tumours by affirming the compression of the cavernous sinus and the dilatation of the veins producing œdematous infiltration. This opinion may be admitted in respect to voluminous tumours occupying a great part of the anterior lobes, but cannot explain the production of blindness when the tumour is small, and separated from the base of the cranium by a layer of cerebral substance."

M. Galezowski refers, in support of his views, to the able paper of M. Lancereaux which I have already quoted at some length.

Disorders of motility existed in each of my cases. Ladame[3] has ascertained the existence of these disorders in five-sixths of his cases. He divides them, according to their origin, into two classes: 1st, those dependent upon irritation; 2d, those arising from loss of function of some part of the brain. Convulsions, ataxia, choreic and rotatory movements belong to the first class, and the various forms of paralysis to the second. In the first case backward movements and ataxia existed, and also paresis of the facial; in the second, the ataxic phenomena were the marked features of the case; in the third, ataxia, embarrassment of speech, dysphagia, and convulsions were present. The symptoms, then, in these cases were chiefly those of irritation, and as the functions of the cerebellum were impaired in each case, the irritation involved this organ. In the first case the neoplasm extended but little beyond the cerebellum; in the second, the supposed tumour most probably involved the inferior peduncles of the cerebellum and the medulla oblongata; in the third, the cerebellum was impinged upon by the tumour, but the most important symptoms were produced by the pressure upon the medulla oblongata, and the interference with the functions of the pneumogastric and with the ninth, producing nausea and vomiting, difficulty in the movements of the tongue and palate, producing stuttering and dysphagia. Paralysis did not exist in either of my cases, except paresis of the facial. This symptom may often possess great diagnostic value: thus, when the paralysis is crossed, or, in other words, when the face is paralyzed on one side and the limbs on the other, there is good ground for diagnosticating tumour of the pons Varolii. When paraplegia exists, as is sometimes observed, the tumour probably affects the medulla oblongata; in this case the paralysis does not occur in the limbs at the same time, but in one after the other. (*Ladame.*)

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[1] Recherches sur les Accidents Diabétiques, etc. Par le Dr. Marchal (De Calvi). Paris, 1864. p. 471.

[2] Étude Ophthalmoscopique, etc., op. cit., p. 149.

[3] Quoted from an abstract of Dr. Ladame's work in the Dublin Quarterly for November, 1866.

In twenty-six cases of tumour of the annular protuberance, Ladame has observed—

Spasms of the muscles of the face in	1
Contractions of members in	2
Tetanic cramps in	1
Convulsions, spasmodic movements, in	3
Epilepsy in	2
Movements of rotation of head in	1
Standing or walking uncertain or impossible in	4
Paralysis, direct, of masseter or temporal	1
" " of facial	11
Paresis of an arm and paralysis of an opposite limb	1
Hemiplegia, complete or incomplete, of side opposite the tumour	12
Paralysis, complete or incomplete, on same side as tumour	1
" general	5
Paresis of an arm on same side as tumour	1
" of both arms, and of a hand of the opposite side	2
Paraplegia	3

It is a curious circumstance that mental derangement occurs as frequently in cases of tumour at the base as in tumour of the cerebrum. In neither of my cases was there any disorder of the mind in the beginning. In the first case the earliest symptom was the development of a quarrelsome disposition; afterwards illusions and attacks of fury. In the third case there was a marked degree of mental hebetude; afterwards stupor, followed by convulsions and maniacal delirium.

Authors differ as to the comparative frequency of mental derangement. Nasse, according to Perrenout, ascertained that mental derangement existed in the proportion of 19 to 50. Calmeil found mental derangement in one-half of his cases. Andral, who has analyzed 43 cases, ascertained that the intelligence was undisturbed in the most of them. Durand-Fardel, who bases his opinion upon an examination of 70 cases, agrees with Andral. Lebert found mental disorder in one-third—29 in 90 cases. Ladame, whose observations I have had occasion so frequently to quote, says that the intellectual functions were affected in one-half of his cases of tumour of the annular protuberance—a proportion quite as large as that noted by Calmeil in tumour of the brain in general. The psychical disorders, he says, are quite as frequent in the cases of tumour of the base as in the cases of tumour of the hemispheres. The intellectual derangements are no doubt due to inflammation and its products, which are always found in the cases of cerebral tumour.

The cases detailed in this paper show how little characteristic are the first symptoms of tumour of the brain. The cases evolve themselves slowly—so slowly, indeed, that it is difficult to fix the date of commencement. In two of my cases the patients attributed the origin of their troubles to "sunstroke." Generally, the earliest symptom is headache; at first slight and intermittent, but increasing in severity, and becoming finally continuous. The headache is followed by disorders of sensation—anæsthesia and hyperæsthesia, usually of the parts supplied by the fifth. Next follow disorders of motility, disturbances of the special senses, and, lastly, mental derangement.

The peculiar character of the symptoms may indicate the situation of the morbid growth.

In cases of tumour of the cerebrum, the following symptoms are observed: headache, not, however, confined to the seat of the morbid growth, and thus indicating its position, but limited to one side of the head, or deep-seated and diffused; epileptiform convulsions, and mental derangement. Alterations of sensibility and of the special senses do not usually occur. Paralysis is not generally present in tumours of the posterior lobes, but is common in tumour of the middle and anterior lobes. Alterations in the special senses occur more frequently in tumour of the middle lobe, except the sense of smell, which is more usually affected by tumour in the anterior lobe.

Tumours of the corpus striatum and optic thalamus are accompanied by the following symptoms: hemiplegia, partial or complete, on the side opposite the tumour, and convulsions; common sensation and the special senses are not frequently affected, and the mind is not often impaired.

In tumour involving the crura cerebri, lesions of sensation and paralysis of the face and of the limbs on the opposite side, giddiness, and paralysis of the motor oculi have been observed.

In tumour of the pituitary gland, the symptoms are frontal headache, amaurosis, first in one eye, then extending to the other. The mental powers are generally unimpaired, and there are no alterations of speech, sensation, or motion. In a case which has been brought to my notice, non-saccharine diuresis and epileptic convulsions were prominent symptoms.

The symptoms are more complex in tumour of the pons. We find here crossed paralysis; face paralyzed on the same, and limbs on the opposite side; pain or anæsthesia in the paralyzed parts; disorders of the special senses; dysphagia, and mental derangement. Convulsions are so uncommon in tumours of the pons, that Ladame lays down the following rule: "If a tumour has attained sufficient size to allow of its presence being diagnosticated, and if convulsions be present, the probability is that the seat of the tumour is not in the pons Varolii." He also considers, and no doubt justly, that the simultaneous affection of several of the organs of sense is indicative of tumour of the pons.

In tumours of the medulla oblongata, pains in the limbs, anæsthesia, convulsions, and sometimes partial or complete paraplegia, giddiness, vomiting, staggering gait, pains in lower extremities, amaurosis, dulness of intellect, hallucinations, delirium, &c., have been observed.

The following symptoms have been noted in tumour of the cerebellum: occipital headache, convulsive attacks, defect in the power of co-ordination, whence walking and standing are difficult or impossible, convergent strabismus, amaurosis; usually no disturbances of sensation except headache; no paralysis; no lesions of speech; no mental derangement. Mental derangement, however, does occur sometimes in case of tumour of the cerebellum, as a result of the changes in the circulation of the brain produced by the irritation of the new growth.

I might have gone with some particularity into the different varieties of tumours which grow within the cranium, but this inquiry would hardly be pertinent to the object which I have had in view—to present the clinical relations of cerebral tumours.

ART. III.—*On the Action of the Hyposulphite of Soda in Intermittents.*

By C. H. CHUBB, M. D., Cambridge, Md.

THE hyposulphite of soda, having recently obtained some reputation as a remedy in malarial diseases, I was led to make a trial of it in a number of cases, with the following results:—

Of twenty-seven cases in which the remedy was administered, the paroxysms were arrested in twenty-five; in eleven of these the arrest was immediate, no paroxysm occurring after the treatment was instituted.